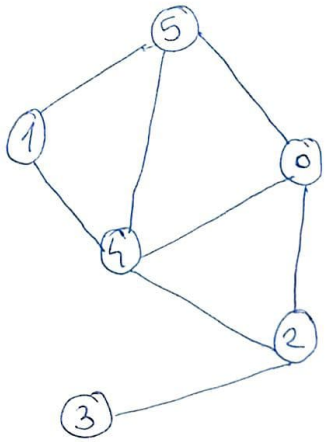
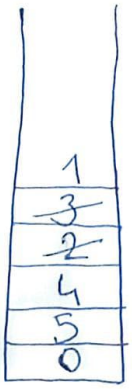
Undirected Graph

1)

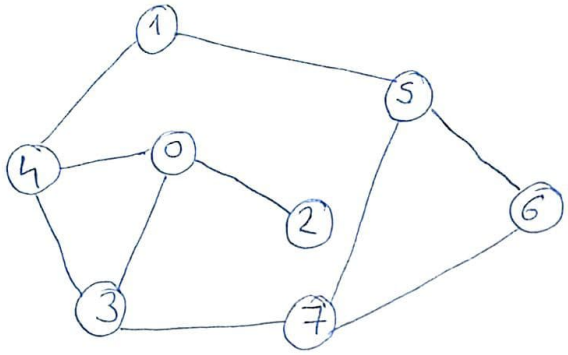


1) DFS: 0



V	marked[]	edgeTo[]
0	T	—
1	T	4
2	T	4
3	T	2
4	T	5
5	T	0

2)



0) [0]

1) [4 | 3 | 2]

2) [3 | 2 | 1]

3) [2 | 1 | 7]

4) [1 | 7]

5) [7 | 5]

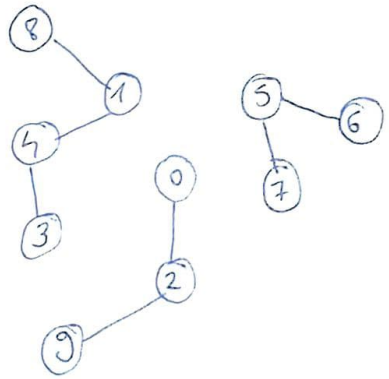
6) [5 | 6]

7) [6]

8) [ ] ✓✓

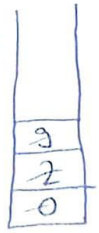
V	edgeTo[]	dist()
0	—	0
1	4	2
2	0	1
3	0	1
4	0	1
5	1	3
6	7	3
7	3	2

3)

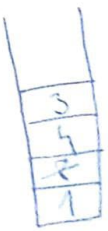


V	ID[]
0	0
1	1
2	0
3	1
4	1
5	2
6	2
7	2
8	1
9	0

1) DFS: 0



2) DFS: 1

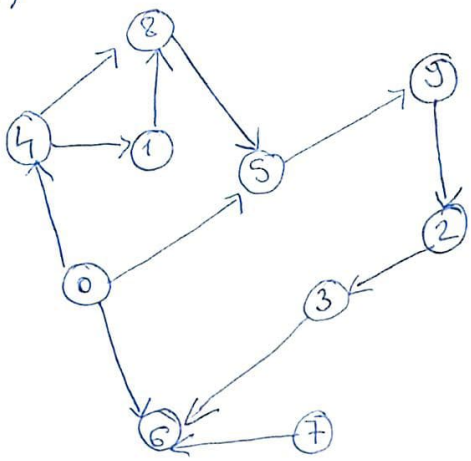


3) DFS: 5

Directed Graphs

TPS: 7, 0, 4, 1, 8, 5, 9, 2, 3, 6

1)



1) DFS: 0

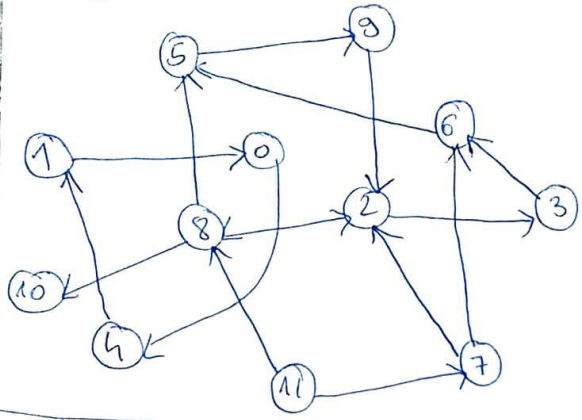
2) DFS: 7

TPS: 7, 0, 4, 1, 8, 5, 9, 2, 3, 6

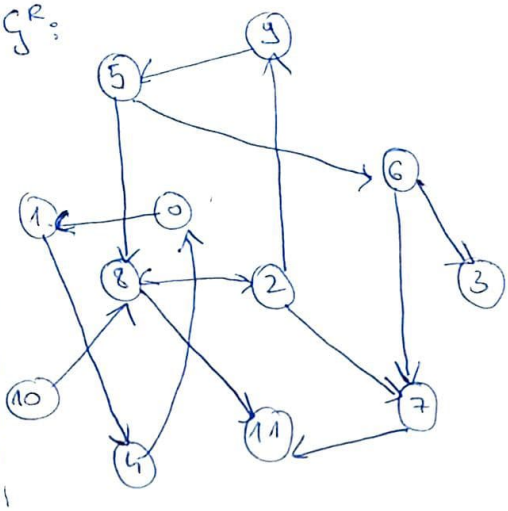
V	marked	edgeTo[]
0	T	—
1	T	4
2	T	9
3	T	2
4	T	0
5	T	0
6	T	0
7	T	—
8	T	4
9	T	5

2)

G:



G^R:



V	marked	edgeTo[]
0	T	-
1	T	0
2	T	—
3	T	6
4	T	1
5	T	9
6	T	5
7	T	6
8	T	5
9	T	2
10	T	—
11	T	8

Reversed Post Order of G^R: 10, 2, 9, 5, 6, 3, 7, 8, 11, 0, 1, 4

1) DFS: 0

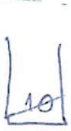
2) DFS: 2

3) DFS: 10

V	IDFT
0	5
1	5
2	1
3	1
4	5
5	1
6	1
7	2
8	3
9	1
10	0
11	4

10, 2, 9, 5, 6, 3, 7, 8, 11, 0, 1, 4

1) DFS: 10



2) DFS: 2

3) DFS: 7

4) DFS: 8

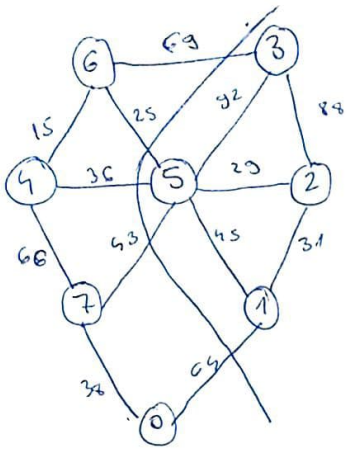
5) DFS: 11

6) DFS: 0

Minimum Spanning Trees

MST: 5-6, 1-2, 4-6, 1-2, 7-5, 3-6, 0-7

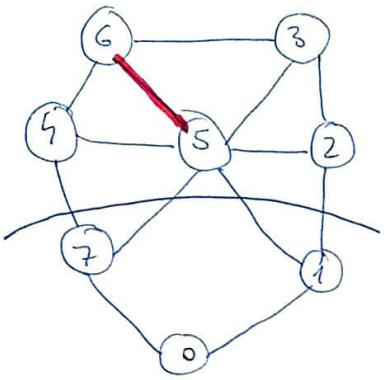
1)



1)

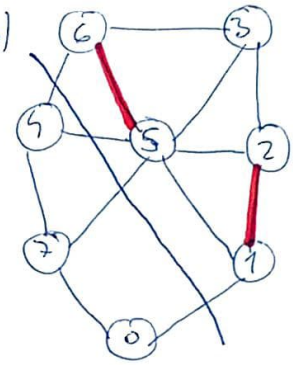
5-6	25
5-4	36
5-7	43
1-0	64
3-6	69

2)



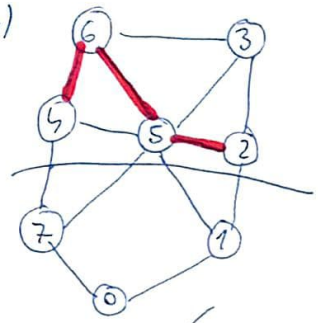
1-2	31
7-5	43
1-5	45
7-4	66

3)



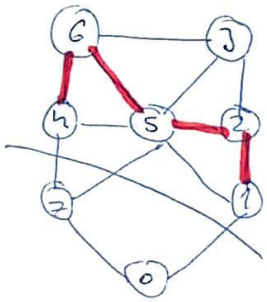
4-6	15
4-5	36
7-5	43
0-1	64

4)



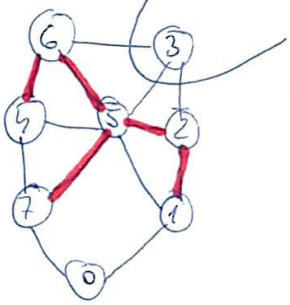
1-2	31
7-5	43
1-5	45
7-4	66

5)



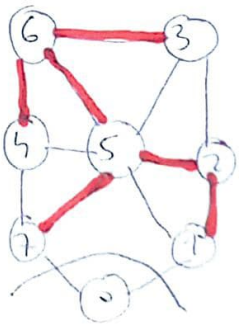
7-5	43
0-1	64
7-4	66

6)



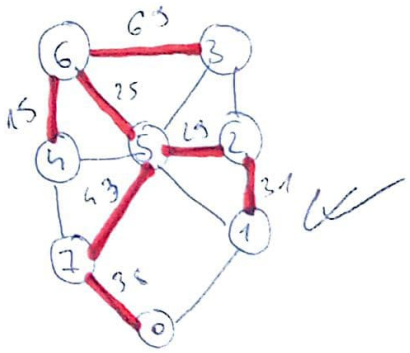
3-6	69
3-2	88
3-5	97

7)

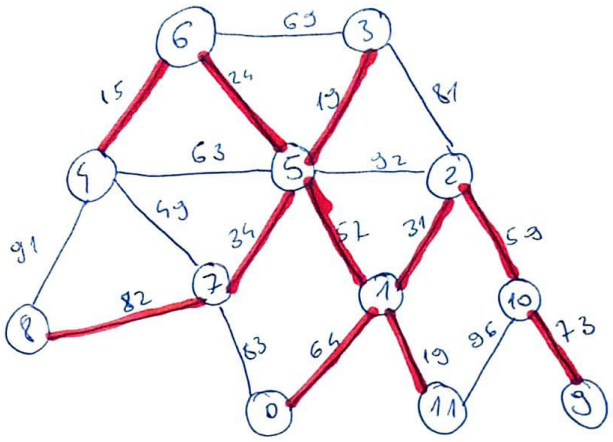


0-7	38
0-1	64

8)



2)

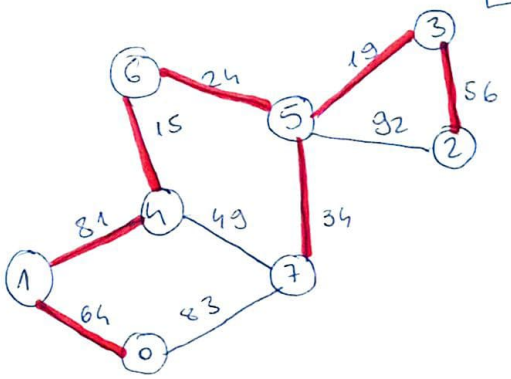


MST: 4-6, 3-5, 1-11, 5-6, 1-2, 5-7, 1-5, 2-10, 0-1, 9-10, 7-8

4-6	15
3-5	19
1-11	19
5-6	24
1-2	31
5-7	34
4-7	49 X
1-5	57
2-10	59
4-5	63 X
0-1	64
3-6	69 X
9-10	73
2-3	81 X
7-8	82
0-7	63 X
4-8	91 X
2-5	32 X
10-11	96 X

MST: 0-1, 1-4, 4-6, 6-5, 5-3, 5-7, 4-7

3)



1)

0-1	64
0-7	83

2)

1-4	81
0-7	83

3)

4-6	15
4-7	49
0-7	83

4)

6-5	24
4-7	49
0-7	83

5)

5-3	19
5-7	34
4-7	49
0-7	83
5-2	92

6)

5-7	34
4-7	49
3-2	56
0-7	83
5-2	92

7)

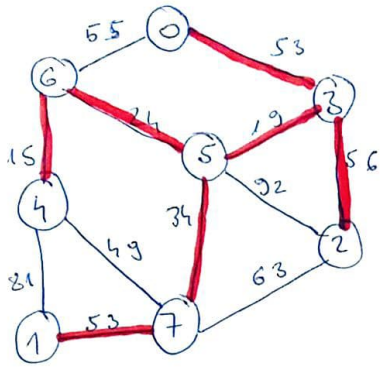
4-7	49
3-2	56
0-7	83
5-2	92

2)

MST: 0-3, 3-5, 5-6, 6-4, 5-7, 7-1, 3-2,

4)

a)



1)

0 - 3	53
0 - 6	55

2)

3 - 5	19
0 - 6	55
3 - 2	56

3)

5 - 6	24
5 - 7	34
0 - 6	55
3 - 2	56
5 - 2	92

4)

6 - 4	15
5 - 7	34
0 - 6	55X
3 - 2	56
5 - 2	92

5)

5 - 7	34
4 - 7	49
0 - 6	55X
3 - 2	56
4 - 1	81
5 - 2	92

6)

4 - 7	49X
7 - 1	53
0 - 6	55X
3 - 2	56
7 - 2	63
4 - 1	81
5 - 2	92

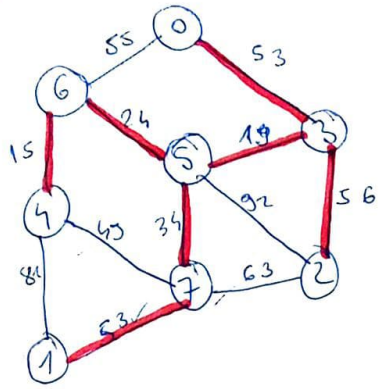
7)

4 - 7	49X
0 - 6	55X
3 - 2	56
7 - 2	63
4 - 1	81X
5 - 2	92

, 4)

MST: 0-3, 3-5, 5-6, 6-4, 5-7, 7-1, 3-2

5)



b)

V	edgeTo[v]	distTo[v]
0	—	0
1	7-1	53
2	3-2	56
3	0-3	53
4	6-4	15
5	3-5	19
6	5-6	24
7	5-7	34

1)

0-3	53
0-6	55

2)

3-5	19
0-6	55
3-2	56

3)

5-6	24
5-7	34
3-2	56

4)

6-4	15
5-7	34
3-2	56

5)

5-7	34
3-2	56
4-1	81

6)

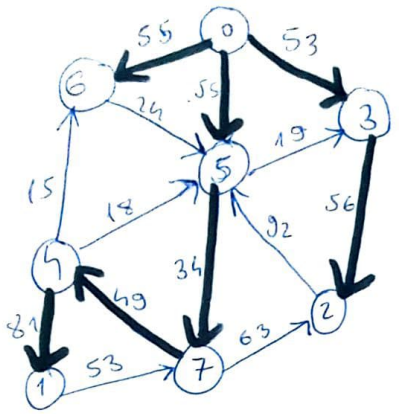
7-1	53
3-2	56

7)

3-2	56

Minimum Shortest Path Tree

1)



1) V: 0
   - 0 → 3 ✓
   - 0 → 5 ✓
   - 0 → 6 ✓

2) V: 3
   - 3 → 2 ✓

3) V: 5
   - 5 → 3 ✗
   - 5 → 7 ✓

4) V: 6
   - 6 → 5 ✗

5) V: 7
   - 7 → 2 ✗
   - 7 → 4 ✓

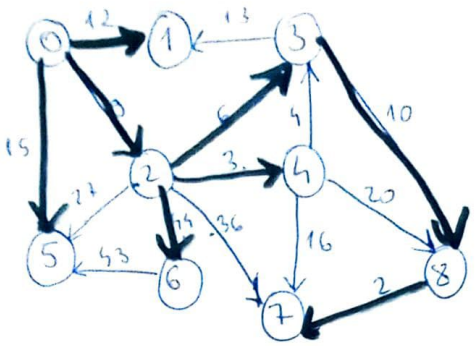
6) V: 2

7) V: 4
   - 4 → 1 ✓
   - 4 → 5 ✗
   - 4 → 6 ✗

8) V: 1
   - 1 → 7 ✗

V	distTo[]	edgeTo[]	
0	0	—	✓
1	219	4 → 1	✓
2	103	3 → 2	✓
3	53	0 → 3	✓
4	138	7 → 4	✓
5	55	0 → 5	✓
6	55	0 → 6	✓
7	89	5 → 7	✓

2)



9) DFS: 0

Topological Order: 0, 2, 4, ~~3~~, 1, 8, 6, 7, 5

V	distTo[]	edgeTo[]
0	0	—
1	12	0 → 1
2	9	0 → 2
3	15	2 → 3
4	~~12~~	2 → 4
5	15	0 → 5
6	53	2 → 6
7	~~45~~ ~~28~~ 27	~~2 → 7~~ ~~4 → 7~~ 8 → 7
8	~~32~~ 25	~~4 → 8~~ 3 → 8

1) V: 0
0 → 1 ✓
0 → 2 ✓
0 → 5 ✓

2) V: 2
2 → 3 ✓
2 → 4 ✓
2 → 5 ✗
2 → 6 ✓
2 → 7 ✓

3) V: 4
4 → 3 ✗
4 → 7 ✓
4 → 8 ✓

4) V: 3
3 → 1 ✗
3 → 8 ✓

5) V: 1

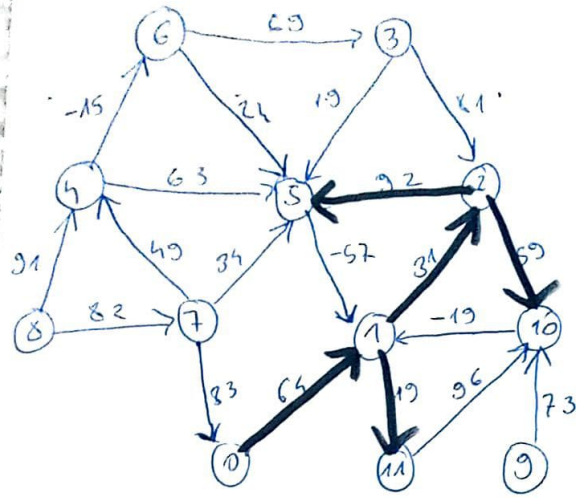
6) V: 8
8 → 7 ✓

7) V: 6
6 → 5 ✗

8) V: 7

9) V: 5

3)



V	dist[v]	edge[v]
0	0	—
1	64	0 → 1
2	95	1 → 2
3		
4		
5	187	2 → 5
6		
7		
8		
9		
10	154	2 → 10
11	83	1 → 11

	P_0	P_1	P_2	P_3	P_4	$P_5 \dots P_V$
0 → 1	✓	X				
1 → 2	✓	X				
1 → 11	✓	X				
2 → 5	✓	X				
2 → 10	✓	X				
3 → 2	X	X				
3 → 5	X	X				
4 → 5	X	X				
4 → 6	X	X				
5 → 1	X	X				
6 → 3	X	X				
6 → 5	X	X				
7 → 0	X	X				
7 → 4	X	X				
7 → 5	X	X				
8 → 4	X	X				
8 → 7	X	X				
9 → 10	X	X				
10 → 1	X	X				
11 → 10	X	X				